AW-CM235NF

IEEE 802.11 a/b/g/n/ac Wireless LAN and Bluetooth M.2 Combo Module

Datasheet

Rev. A

0B

(For Standard)

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Features

- Integrates CYPRESS solutions of CYW4354 Wi-Fi /BT Single Chip
- Concurrent Bluetooth and WLAN operation
- ECI—enhanced coexistence support, ability to coordinate BT SCO transmissions around WLAN receives
- Multiple power saving modes for low power consumption
- Lead-free /Halogen Free Design
- 12 mm(L) x 16mm(W) x 1.5mm(H) 132 pin LGA package

Bluetooth

- Bluetooth Class 1 or Class 2 transmitter operation
- Supports key features of upcoming Bluetooth standards
- Fully supports Bluetooth Core Specification version 5.0 + (Enhanced Data Rate) EDR features:
  - Adaptive Frequency Hopping (AFH)
  - Quality of Service (QoS)
  - Extended Synchronous Connections (eSCO) — Voice Connections
  - Fast Connect (interlaced page and inquiry scans)
  - Secure Simple Pairing (SSP)
  - Sniff Subrating (SSR)
  - Encryption Pause Resume (EPR)
  - Extended Inquiry Response (EIR)
  - Link Supervision Timeout (LST)
- Multipoint operation with up to seven active slaves
  - Maximum of seven simultaneous active ACL links
  - Maximum of three simultaneous active SCO and eSCO connections with scatternet support
- Full support for power savings modes
  - Bluetooth clock request
  - Bluetooth standard sniff
  - Deep-sleep modes and software regulator shutdown
- Wideband speech support (16 bits linear data, MSB first, left justified at 4K samples/s for transparent air coding, both through I2S and PCM interface)
- Multiple simultaneous A2DP audio stream

WLAN

- IEEE 802.11ac Draft compliant
- Full IEEE 802.11a/b/g/n legacy compatibility with enhanced performance
- IEEE 802.11a/b/g/n/ac dual-band radio with virtual-simultaneous dual-band operation
- IEEE 802.11ac 2x2 MIMO supports for 20, 40, and 80 MHz channels with optional SGI (256 QAM modulation) provides data rates up to 866.7 Mbps.
- Tx and Rx low-density parity check (LDPC) support for improved range and power efficiency.
- Supports IEEE 802.15.2 external coexistence interface to optimize bandwidth utilization with other co-located wireless technologies such as LTE, GPS, or WiMAX
- Supports IEEE 802.11d, e, h, i, r, k, w
- WLAN host interface options
  - SDIO
- Security–WEP, WPA/WPA2 (personal), AES (HW), TKIP (HW), CKIP (SW).
- WMM/WMM-PS/WMM-SA

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

- Proprietary protocol – CCXv2/CCXv3/CCXv4/CCXv5
- Integrated CPU with on-chip memory for a complete WLAN subsystem minimizing the need to wake up the applications processor

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Revision History

Document NO: R2-2235NF-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
0.1	2014/12/31		● Initial Version	Alex Yu	Chihhao Liao
0.2	2015/2/10		● Update pin map & pin definition & Specification	Stanley Wang	Chihhao Liao
0.3	2015/4/15		● Update Update Electrical Characteristics	Stanley Wang	Chihhao Liao
0.4	2015/5/15		● Modified Key Features ● Modified Recommended Operating Conditions ● Update Specification & power consumption	Steven Jian	Chihhao Liao
0.5	2017/10/12		● Changed document format ● Updated 1.4.4 Operating Conditions ● Updated 4.1 Mechanical Drawing ● Updated 3. Electrical Characteristics ● Updated 2.2 Pin Table	Steven Jian	Chihhao Liao
0.6	2017/11/27		● Updated 1.4.4 Operating Conditions	Steven Jian	Chihhao Liao
0.7	2018/05/21		● Updated 2.2 Pin Table	Steven Jian	Chihhao Liao
0.8	2018/07/25		● Modified pin10/pin28/pin46 in 2.2 Pin Table	Steven Jian	Chihhao Liao
0.9	2018/09/20		● Modified pin18 in 2.2 Pin Table ● Updated Title	Steven Jian	Chihhao Liao
1.0	2018/12/24		● Support BT 5.0 Core Std	Steven Jian	Chihhao Liao
1.1	2019/07/11		● Updated 1.4.2 ● Updated 2.1	Steven Jian	Chihhao Liao
A	2020/03/06	DCN016828	● Change Document Format ● Updated 3.2 Recommended Operating Conditions ● Updated 3.4 Host Interface	Steven Jian	Chihhao Liao

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

Table of Contents

Revision History **4**
1. Introduction **6**
1.1 Product Overview **6**
1.2 Block Diagram **7**
1.3 Specifications Table **8**
1.3.1 General 8
1.3.2 WLAN 8
1.3.3 Bluetooth 10
1.3.4 Operating Conditions 10
2. Pin Definition **12**
2.1 Pin Map **12**
2.2 Pin Table **13**
3. Electrical Characteristics **17**
3.1 Absolute Maximum Ratings **17**
3.2 Recommended Operating Conditions **17**
3.3 GPIO DC Characteristics **18**
3.4 Host Interface **19**
3.4.1 PCM Interface Timing 19
3.4.2 SDIO 25
3.4.3 UART Interface 33
3.5 Power up Timing Sequence **35**
3.6 Power Consumption* **37**
3.6.1 WLAN 37
3.6.2 Bluetooth 37
4. Mechanical Information **38**
4.1 Mechanical Drawing **38**
5. Packaging Information **40**

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the advanced IEEE 802.11 ac/a/b/g/n 2x2 MIMO WLAN and Bluetooth M.2 combo module - AW-CM235NF. The module is targeted to mobile and embedded devices which need small footprint package, low power consumption, and multiple OS support. The module supports 2.4GHz and 5GHz bands IEEE 802.11ac MAC/baseband/radio and Bluetooth 5.0 + EDR. It also features an integrated Power Management Unit (PMU), Power Amplifiers (PAs), and a Low Noise Amplifier (LNA) to address the needs of mobile devices that require minimal power consumption and compact size. By using AW-CM235NF, the customers can easily enable the Wi-Fi and BT embedded applications with the benefits of high design flexibility, short development cycle, and quick time-to-market.

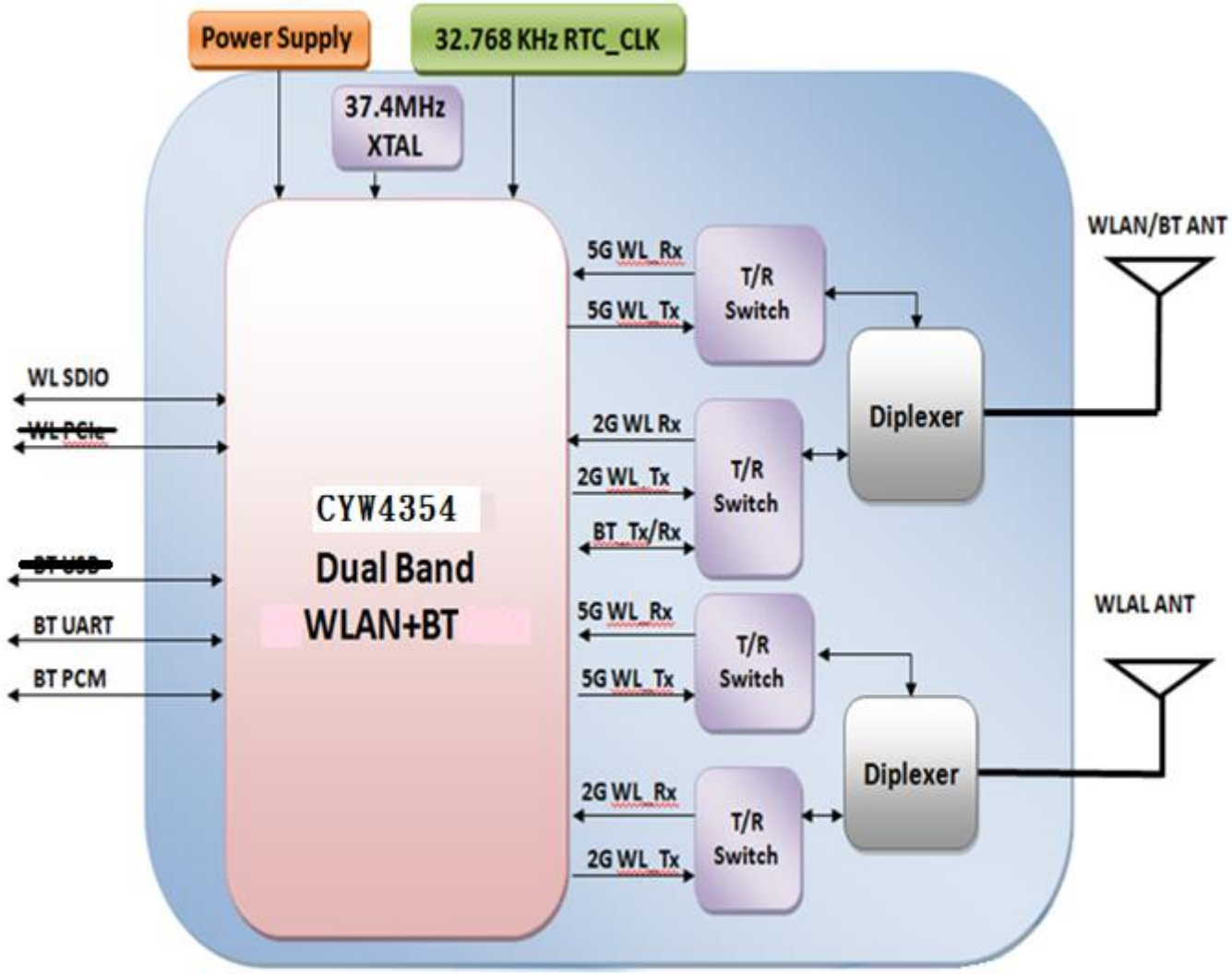
For the WLAN operation, the AW-CM235NF uses DSSS, OFDM, DBPSK, DQPSK, CCK and QAM baseband modulation technologies. In IEEE 802.11ac mode, the WLAN operation supports rates of MCS0–MCS9 (up to 256 QAM) in 20 MHz, 40 MHz, and 80 MHz channels for data rates up to 867 Mbps. A high level of integration and full implementation of the power management functions specified in the IEEE 802.11 standard minimize the system power requirements by using AW-CM235NF. In addition to the support of WPA/WPA2 (personal) and WEP encryption, the AW-CM235NF also supports the IEEE 802.11i security standard through AES and TKIP acceleration hardware for faster data encryption. For the video, voice and multimedia applications the AW-CM235NF support 802.11e Quality of Service (QoS).

For Bluetooth operation, the AW-CM235NF is Bluetooth 5.0. The Bluetooth transmitter also features a Class 1 power amplifier with Class 2 capability. The AW-CM235NF supports extended Synchronous Connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets, and Adaptive Frequency Hopping (AFH) for reducing radio frequency interference. It incorporates all Bluetooth 5.0 features.

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1.2 Block Diagram



AzureWave

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n/ac Wireless LAN and Bluetooth M.2 Combo Module
Major Chipset	CYPRESS CYW4354
Host Interface	WLAN: SDIO V 3.0 Bluetooth: UART
Dimension	16mm(L) 12xmm(W) x 1.5mm(H)
Package	M.2 1216 Solder down
Antenna	HSC Receptacle(refer to 4.1 Mechanical Drawing) Ant 1: Wi-Fi/BT Main Ant 2: WIFI AUX
Weight	0.6g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11a/b/g/n/ac, Wi-Fi compliant
WLAN VID/PID	n/a
WLAN SVID/SPID	n/a
Frequency Rage	WLAN: 2.4 GHz / 5GHz Band
Modulation	DSSS DBPSK(1Mbps), DQPSK(2Mbps), CCK(11/5.5Mbps) OFDM BPSK(9/6Mbps/MCS0), QPSK(18/12Mbps/MCS1~2), 16-QAM(36/24Mbps/MCS3~4), 64-QAM(72.2/54/48Mbps/MCS5~7), 256-QAM(MCS8~9)
Number of Channels	802.11b: USA, Canada and Taiwan – 1 ~ 11 Most European Countries – 1 ~ 13 Japan – 1 ~ 13 802.11g: USA and Canada – 1 ~ 11

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

<table>
<tr><td></td><td>Most European Countries – 1 ~ 13
802.11n:
USA and Canada – 1 ~ 11
Most European Countries – 1 ~ 13
802.11a:
USA – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165</td></tr>
<tr><td>Output Power
(Board Level Limit)*</td><td>2.4G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11b (11Mbps)
@EVM<35%</td><td>14</td><td>16</td><td>18</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)
@EVM≦ -25 dB</td><td>12</td><td>14</td><td>16</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦ -27 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)
@EVM≦ -27 dB</td><td>9</td><td>11</td><td>13</td><td>dBm</td></tr>
</table>
5G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11a (54Mbps)
@EVM≦ -25 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦ -27 dB</td><td>10</td><td>12</td><td>14</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)
@EVM≦ -27 dB</td><td>8</td><td>10</td><td>12</td><td>dBm</td></tr>
<tr><td>11ac (VHT80 MCS9)
@EVM≦ -32 dB</td><td>6</td><td>8</td><td>10</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Receiver Sensitivity</td><td>2.4G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11b (11Mbps)</td><td></td><td>-88</td><td>-78</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td></td><td>-74</td><td>-65</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-71</td><td>-64</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)</td><td></td><td>-68</td><td>-61</td><td>dBm</td></tr>
</table>
5G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11a (54Mbps)</td><td></td><td>-73</td><td>-65</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-70</td><td>-64</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)</td><td></td><td>-67</td><td>-61</td><td>dBm</td></tr>
<tr><td>11ac (VHT80 MCS9)</td><td></td><td>-59</td><td>-51</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Data Rate</td><td>802.11b: 1, 2, 5.5, 11Mbps
802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11n: MCS0~7 HT20/HT40
802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps</td></tr>
</table>

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

	802.11ac: MCS0~8 VHT20 802.11ac: MCS0~9 VHT40/VHT80
Security	◆ WPA™- and WPA2™- (Personal) support for powerful encryption and authentication ◆ AES and TKIP acceleration hardware for faster data encryption and 802.11i compatibility ◆ Secure Easy Setup™ for simple Wi-Fi® setup and WPA2/WPA security configuration ◆ Wi-Fi Protected Setup (WPS) ◆ WEP ◆ WMM / WMM-SA ◆ CKIP(Software)

1.3.3 Bluetooth

Features	Description
Bluetooth Standard	Bluetooth 2.1+Enhanced Data Rate (EDR) / BT5.0
Bluetooth VID/PID	n/a
Frequency Rage	2400~2483.5MHz
Modulation	GFSK (1Mbps), Π/4DQPSK (2Mbps) and 8DPSK (3Mbps)
Output Power	Class 2
Receiver Sensitivity	

	Min	Typ	Max	Unit
DH5		-92	-82	dBm
2DH5		-94	-84	dBm
3DH5		-88	-78	dBm

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	power supply for host:3.3V+-5%
Operating Temperature	-30~85°C (Functionality is guaranteed. Optimal RF operating is 0~55°C)
Operating Humidity	<85%
Storage Temperature	-40~85°C
Storage Humidity	<60 %

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

ESD Protection	
Human Body Model	±1KV
Changed Device Model	±300V

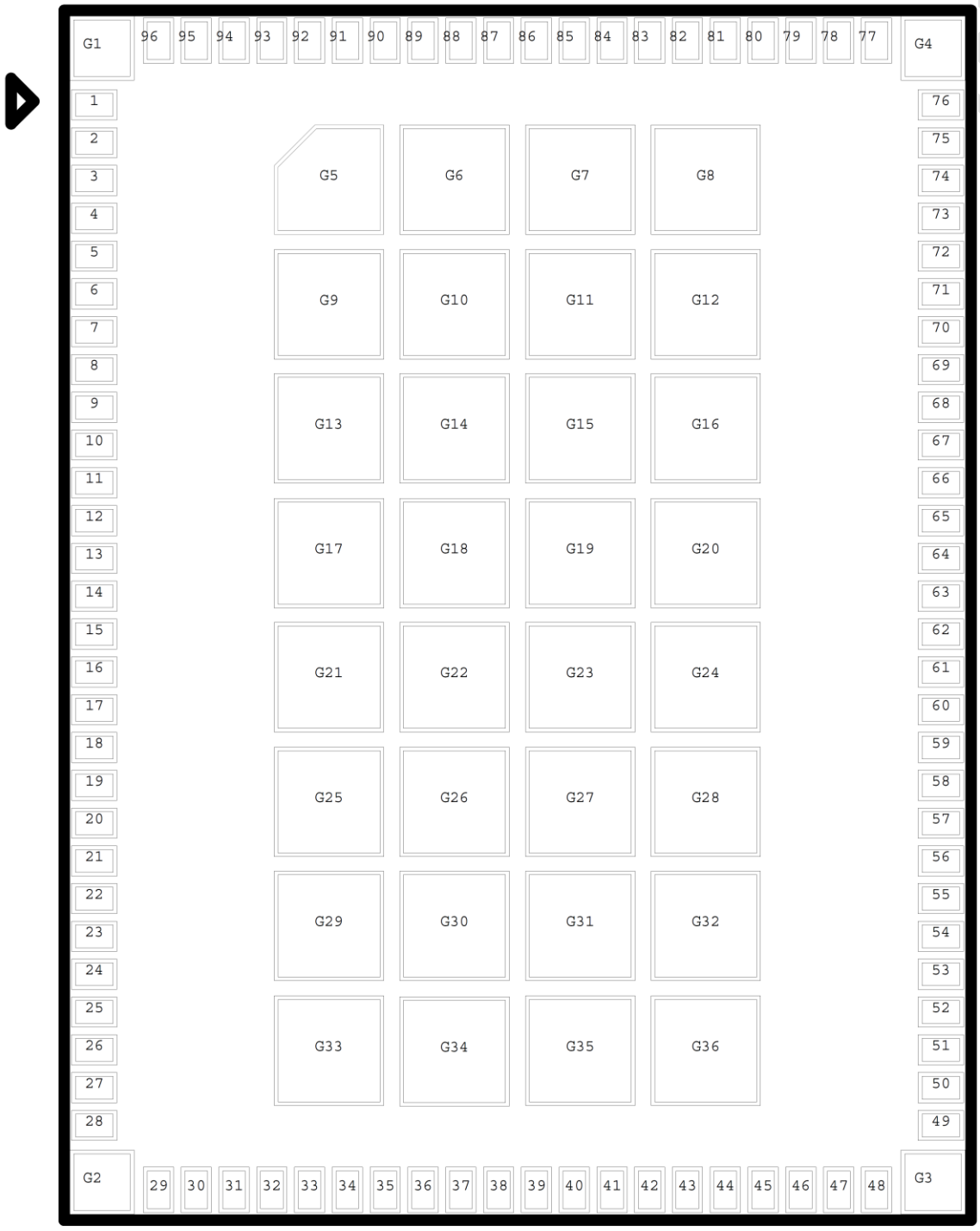
AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

2. Pin Definition

2.1 Pin Map

AW-CM235 Top View Pin Map



The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	NC	No Connect		
2	JTAG_SEL	JTAG test on/off(pull high to enable JTAG)	VIO	I
3	NC	No Connect		
4	3.3V	3.3V Power Supply	3.3V	I
5	3.3V	3.3V Power supply input	3.3V	I
6	GND	System Ground Pin		
7	JTAG_TDO_GPIO_5	GPIO_5 (input/output)	VIO	O
8	GPIO_8	Strapping option(please pull down with 10k resistor)	VIO	I
9	GPIO_9	Strapping option(please pull down with 10k resistor)	VIO	I
10	JTAG_TDI_GPIO_4	0: SPROM is absent (default). *Please reserve pull-down resistor	VIO	I
11	JTAG_TMS_COEX2_GPIO_3	GPIO_3 (input/output)	VIO	I/O
12	JTAG_TCK_COEX1_GPIO_2	GPIO_2 (input/output)	VIO	I/O
13	JTAG_TRST_N_COEX0_GPIO_6	GPIO_6 (input/output)	VIO	I/O
14	NC	No Connect		
15	NC	No Connect		
16	NC	No Connect		
17	GND	System Ground Pin		
18	NC	No Connect		
19	NC	No Connect		
20	GND	System Ground Pin		
21	NC	No Connect		
22	NC	No Connect		
23	GND	System Ground Pin		
24	BT_DEV_WAKE	Bluetooth DEV_WAKE.	VIO	I
25	NC	No Connect		
26	GND	System Ground Pin		
27	SLPCLK	External sleep clock input (32.768 kHz).	0.2~3.3 Vp-p	I
28	WL_RFDISABLE_L_GPIO1	WL_DEV_WAKE/GPIO1	VIO	I
29	PCIE_WAKEn	Reserved		
30	PCIE_CLKREQn	Reserved		
31	PCIE_PERSTn	Reserved		
32	GND	System Ground Pin		

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

33	PCIE_RCLK_N	Reserved		
34	PCIE_RCLK_P	Reserved		
35	GND	System Ground Pin		
36	PCIE_TX_N	Reserved		O
37	PCIE_TX_P	Reserved		O
38	GND	System Ground Pin		
39	PCIE_RX_N	Reserved		I
40	PCIE_RX_P	Reserved		I
41	GND	System Ground Pin		
42	NC	No Connect		
43	NC	No Connect		
44	VIO_SD	1.8V/3.3V Digital I/O SDIO Power Supply	VIO	I
45	WL_REG_ON	Used by PMU to power up or power down the internal module regulators used by the WLAN section. Also, when deasserted, this pin holds the WLAN section in reset.	VIO	I
46	SDIO_WAKE_L_GPIO_0	WL_HOST_WAKE	VIO	O
47	SDIO DAT3	SDIO Data line Bit[3]	VIO	I/O
48	SDIO DAT2	SDIO Data line Bit[2]	VIO	I/O
49	SDIO DAT1	SDIO Data line Bit[1]	VIO	I/O
50	SDIO DAT0	SDIO Data line Bit[0]	VIO	I/O
51	SDIO CMD	SDIO Command/response (input/output)	VIO	I/O
52	SDIO CLK	SDIO Clock input	VIO	I
53	BT_HOST_WAKE	Bluetooth HOST_WAKE.	VIO	O
54	UART CTSn	UART_CTSn (input)	VIO	I
55	UART SOUT	UART_TXD (output)	VIO	O
56	UART SIN	UART_RXD (input)	VIO	I
57	UART RTSn	UART_RTSn (output)	VIO	O
58	PCM_SYNC	PCM sync; can be master (output) or slave (input).	VIO	I/O
59	PCM_IN	PCM data input	VIO	I
60	PCM_OUT	PCM data output	VIO	O
61	PCM_CLK	PCM bus clock; can be master (output) or slave (input)	VIO	I/O
62	GND	System Ground Pin		
63	BT_REG_ON	Used by PMU to power up or power down the internal module regulators used by the Bluetooth section. Also, when deasserted, this pin holds the Bluetooth section in reset.	VIO	I
64	WL_LED_GPIO_7	It can be used as WL_LED.	VIO	O
65	BT_I2S_DO_BT_LED_L	It can be used as BT_LED.	VIO	O
66	NC	No Connect		
67	NC	No Connect		
68	GND	System Ground Pin		

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

69	USB_D-	No Connect		
70	USB_D+	No Connect		
71	GND	System Ground Pin		
72	3.3V	3.3V Power Supply	3.3V	I
73	VIO	Digital I/O Power Supply	VIO	I
74	GND	System Ground Pin		
75	GND	System Ground Pin		
76	GND	System Ground Pin		
77	GND	System Ground Pin		
78	GND	System Ground Pin		
79	GND	System Ground Pin		
80	GND	System Ground Pin		
81	GND	System Ground Pin		
82	GND	System Ground Pin		
83	GND	System Ground Pin		
84	GND	System Ground Pin		
85	GND	System Ground Pin		
86	GND	System Ground Pin		
87	GND	System Ground Pin		
88	GND	System Ground Pin		
89	GND	System Ground Pin		
90	GND	System Ground Pin		
91	GND	System Ground Pin		
92	GND	System Ground Pin		
93	GND	System Ground Pin		
94	GND	System Ground Pin		
95	GND	System Ground Pin		
96	GND	System Ground Pin		
G1	GND	System Ground Pin		
G2	GND	System Ground Pin		
G3	GND	System Ground Pin		
G4	GND	System Ground Pin		
G5	GND	System Ground Pin		
G6	GND	System Ground Pin		
G7	GND	System Ground Pin		
G8	GND	System Ground Pin		
G9	GND	System Ground Pin		
G10	GND	System Ground Pin		
G11	GND	System Ground Pin		
G12	GND	System Ground Pin		
G13	GND	System Ground Pin		
G14	GND	System Ground Pin		
G15	GND	System Ground Pin		
G16	GND	System Ground Pin		

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

G17	GND	System Ground Pin		
G18	GND	System Ground Pin		
G19	GND	System Ground Pin		
G20	GND	System Ground Pin		
G21	GND	System Ground Pin		
G22	GND	System Ground Pin		
G23	GND	System Ground Pin		
G24	GND	System Ground Pin		
G25	GND	System Ground Pin		
G26	GND	System Ground Pin		
G27	GND	System Ground Pin		
G28	GND	System Ground Pin		
G29	GND	System Ground Pin		
G30	GND	System Ground Pin		
G31	GND	System Ground Pin		
G32	GND	System Ground Pin		
G33	GND	System Ground Pin		
G34	GND	System Ground Pin		
G35	GND	System Ground Pin		
G36	GND	System Ground Pin		

AzureWave Co

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3.3V	Power supply for Internal Regulators	-0.3		5.5	V
VIO	DC supply voltage for digital I/O	-0.5		3.9	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3.3V	Power supply for Internal Regulators	3.13	3.3	3.46	V

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.3 GPIO DC Characteristics

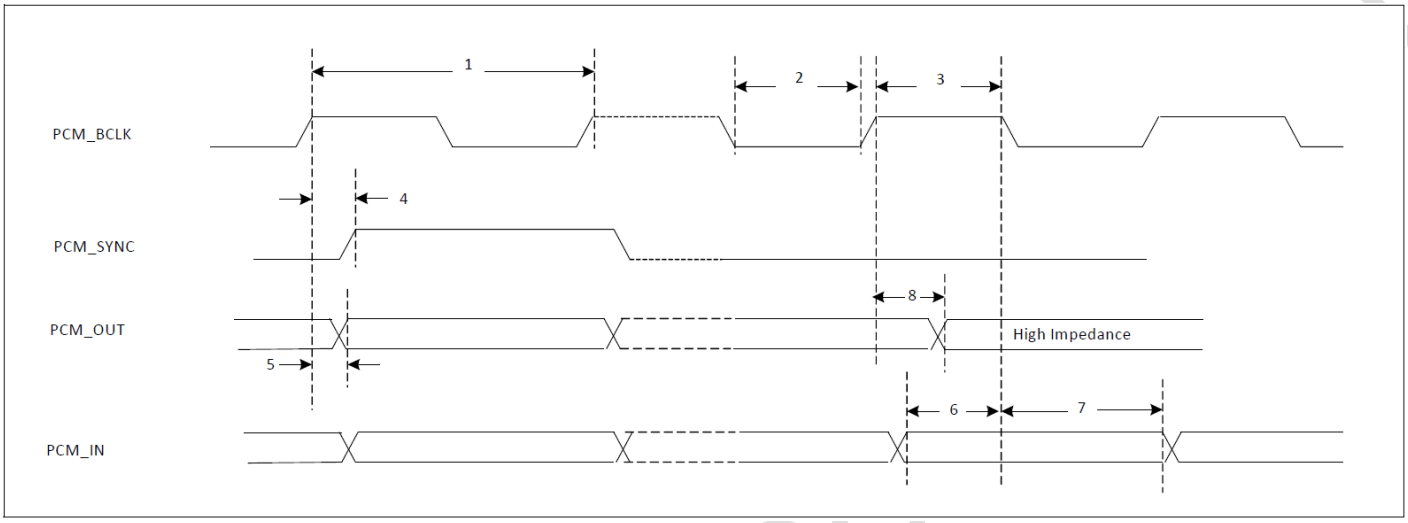
Symbol	Parameter	Minimum	Typical	Maximum	Unit
For SDIO Interface VIO_SD =1.8V					
VIH	Input high voltage	1.27	-	-	V
VIL	Input low voltage	-	-	0.58	V
VOH	Output High Voltage @ 2mA	1.4	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.45	V
For SDIO Interface VIO_SD =3.3V					
VIH	Input high voltage	2.06	-	-	V
VIL	Input low voltage	-	-	0.82	V
VOH	Output High Voltage @ 2mA	2.47	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.41	V
Other Digital Interface VIO=1.8V					
VIH	Input high voltage	1.17	-	-	V
VIL	Input low voltage	-	-	0.63	V
VOH	Output High Voltage @ 2mA	1.35	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.45	V
Other Digital Interface VIO=3.3V					
VIH	Input high voltage	2	-	-	V
VIL	Input low voltage	-	-	0.8	V
VOH	Output High Voltage @ 2mA	2.9	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.4	V

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4 Host Interface

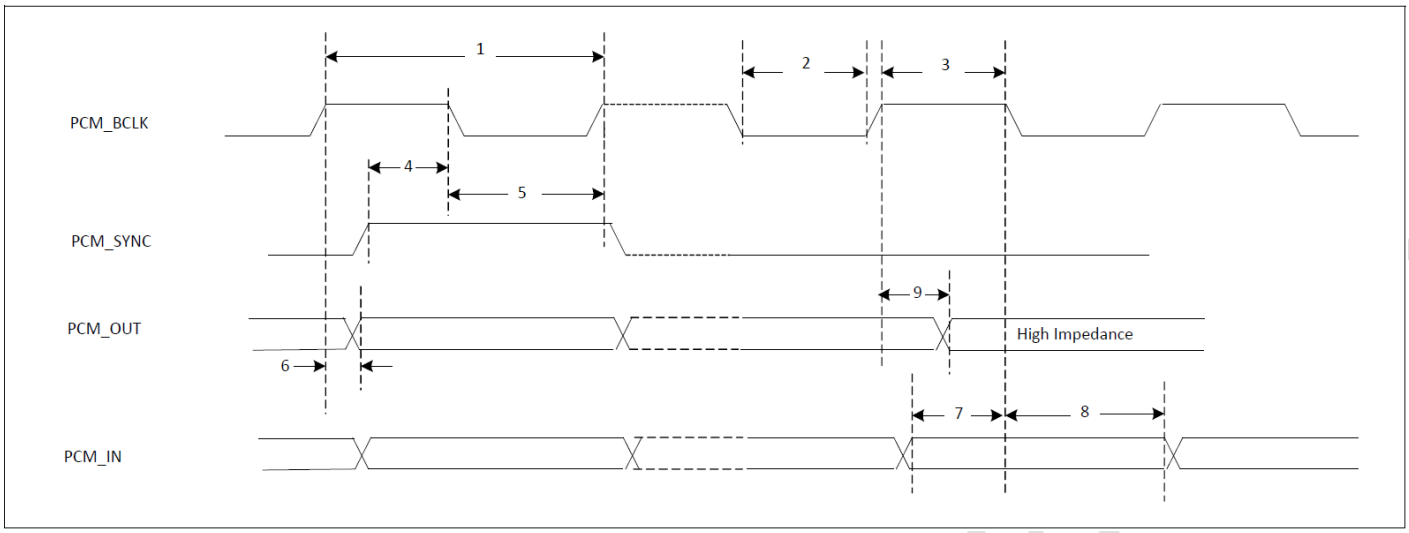
3.4.1 PCM Interface Timing



PCM Timing Diagram (Short Frame Sync, Master Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC delay	0		25	ns
5	PCM_OUT delay	0		25	ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns
8	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

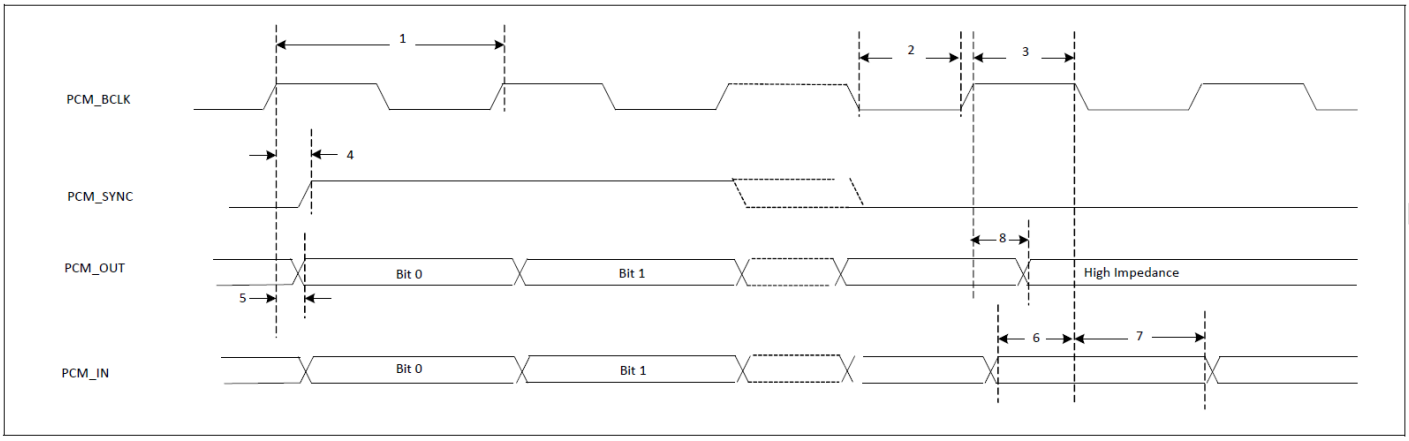


PCM Timing Diagram (Short Frame Sync, Slave Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_OUT delay	0		25	ns
7	PCM_IN setup	8			ns
8	PCM_IN hold	8			ns
9	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

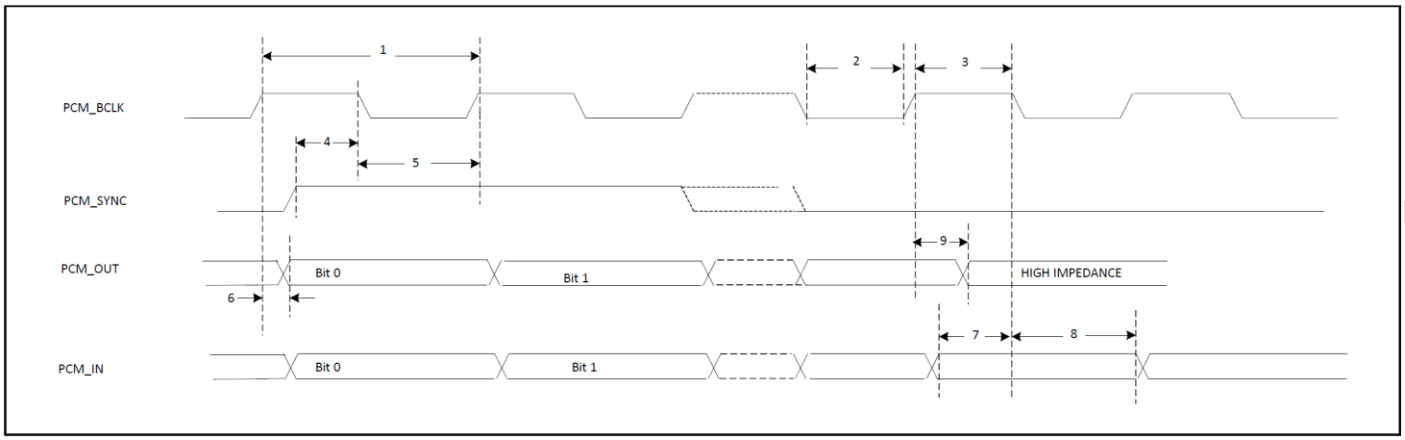


PCM Timing Diagram (Long Frame Sync, Master Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC delay	0		25	ns
5	PCM_OUT delay	0		25	ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns
8	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

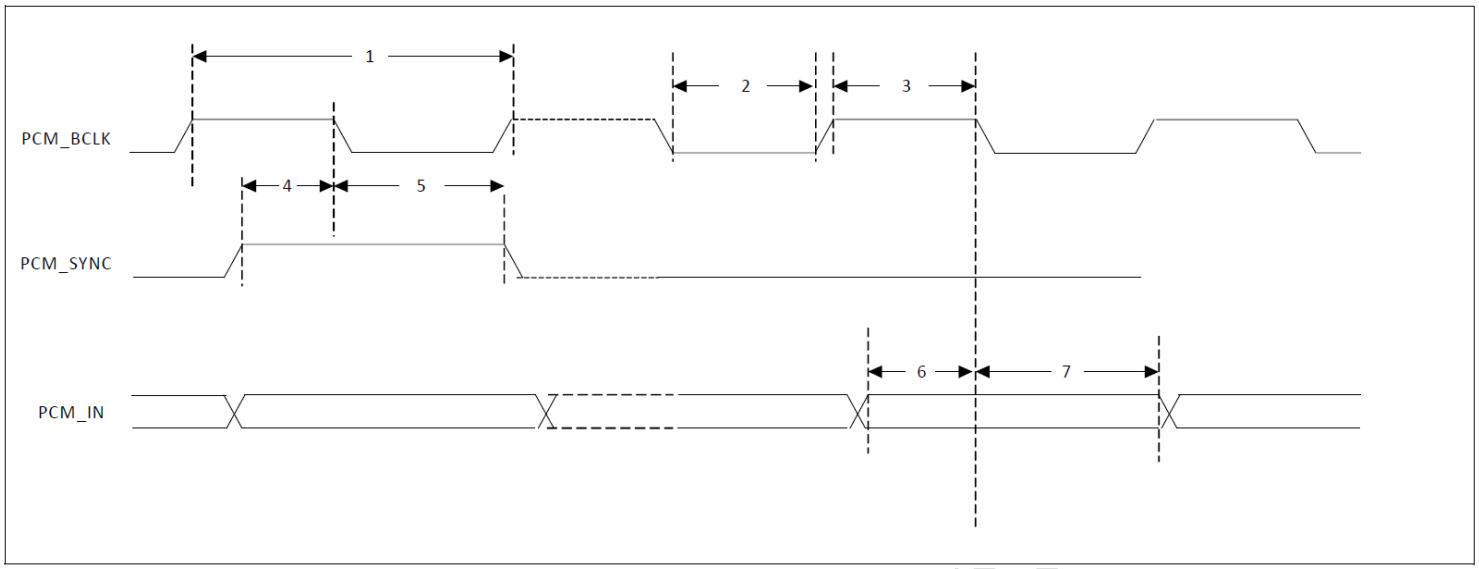


PCM Timing Diagram (Long Frame Sync, Slave Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_OUT delay	0		25	ns
7	PCM_IN setup	8			ns
8	PCM_IN hold	8			ns
9	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

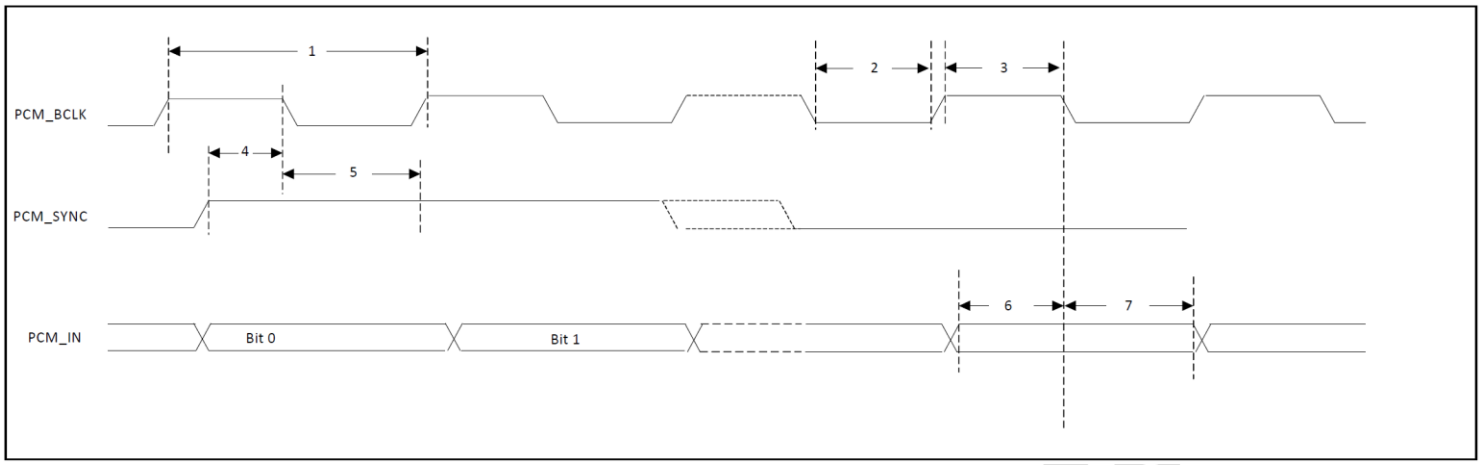


PCM Burst Mode Timing (Receive Only, Short Frame Sync)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			24	MHz
2	PCM bit clock low	20.8			ns
3	PCM bit clock high	20.8			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns

AzureWave Confi

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



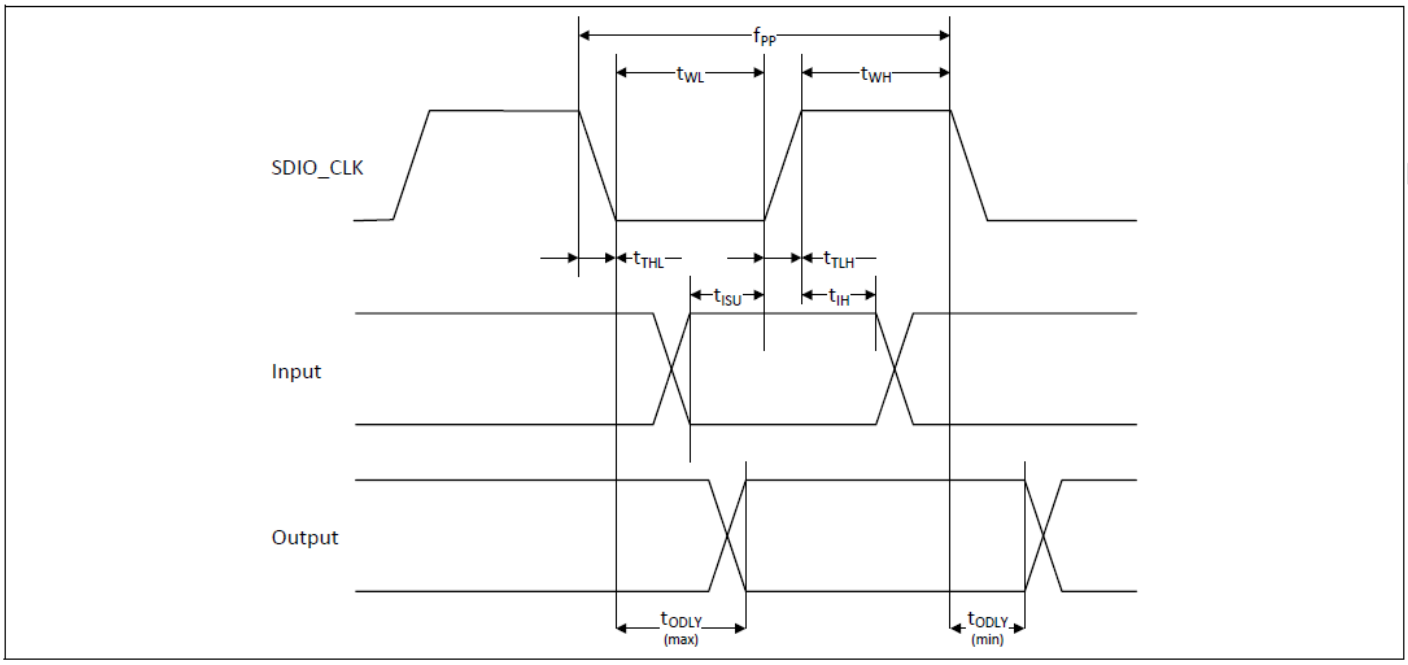
PCM Burst Mode Timing (Receive Only, Long Frame Sync)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			24	MHz
2	PCM bit clock low	20.8			ns
3	PCM bit clock high	20.8			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4.2 SDIO



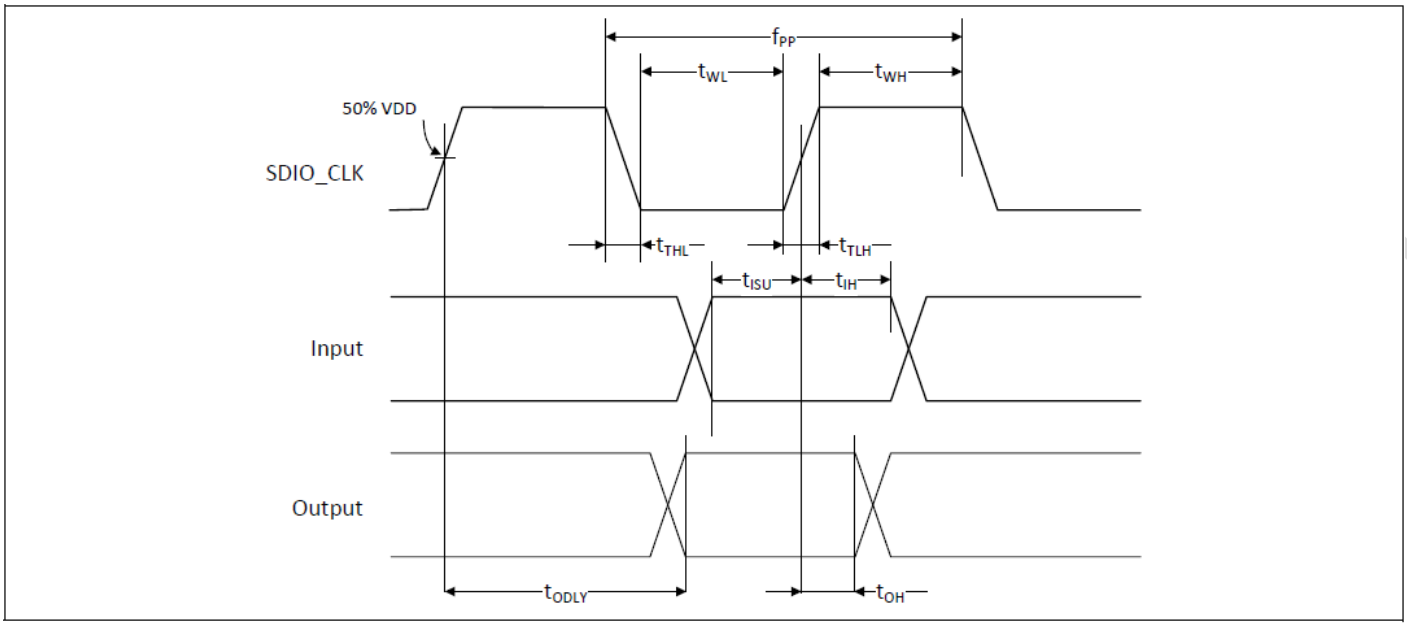
SDIO Bus Timing (Default Mode)*

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL*)					
Frequency – Data Transfer mode	fPP	0	–	25	MHz
Frequency – Identification mode	fOD	0	–	400	kHz
Clock low time	tWL	10	–	–	ns
Clock high time	tWH	10	–	–	ns
Clock rise time	tTLH	–	–	10	ns
Clock low time	tTHL	–	–	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	tISU	5	–	–	ns
Input hold time	tIH	5	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer mode	tODLY	0	–	14	ns
Output delay time – Identification mode	tODLY	0	–	50	ns

SDIO Bus Timing Parameters (Default Mode)

* min (VIH) = 0.7 × VDDIO and max (VIL) = 0.2 × VDDIO
* Timing is based on CL ≦ 40pF load on CMD and Data.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



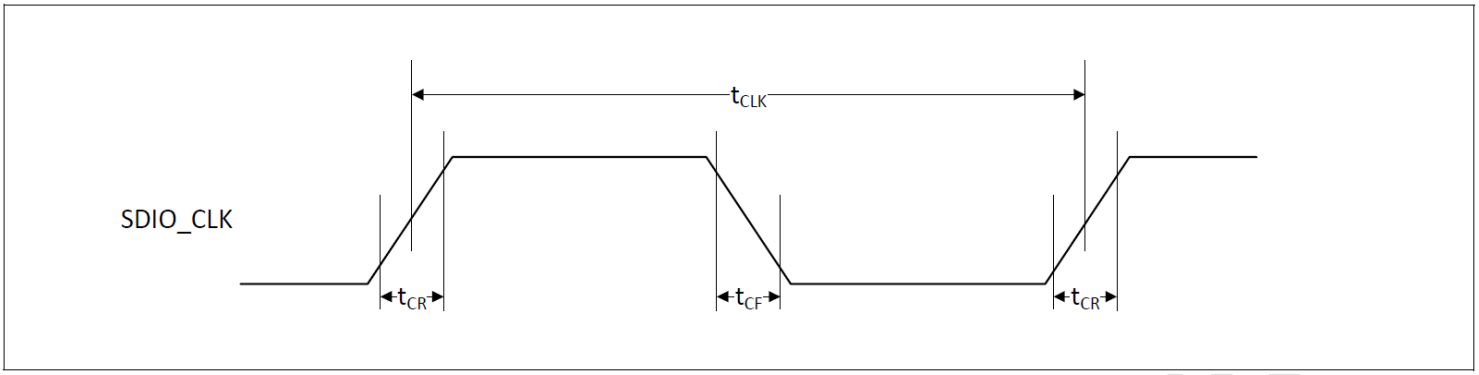
SDIO Bus Timing (High-Speed Mode)*

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (all values are referred to minimum VIH and maximum VIL*)					
Frequency – Data Transfer Mode	fPP	0	–	50	MHz
Frequency – Identification Mode	fOD	0	–	400	kHz
Clock low time	tWL	7	–	–	ns
Clock high time	tWH	7	–	–	ns
Clock rise time	tTLH	–	–	3	ns
Clock low time	tTHL	–	–	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup Time	tISU	6	–	–	ns
Input hold Time	tIH	2	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer Mode	tODLY	–	–	14	ns
Output hold time	tOH	2.5	–	–	ns
Total system capacitance (each line)	CL	–	–	40	pF

SDIO Bus Timing a Parameters (High-Speed Mode)

* min (Vih) = 0.7 × VDDIO and max (Vil) = 0.2 × VDDIO
* Timing is based on CL ≦ 40pF load on CMD and Data.

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



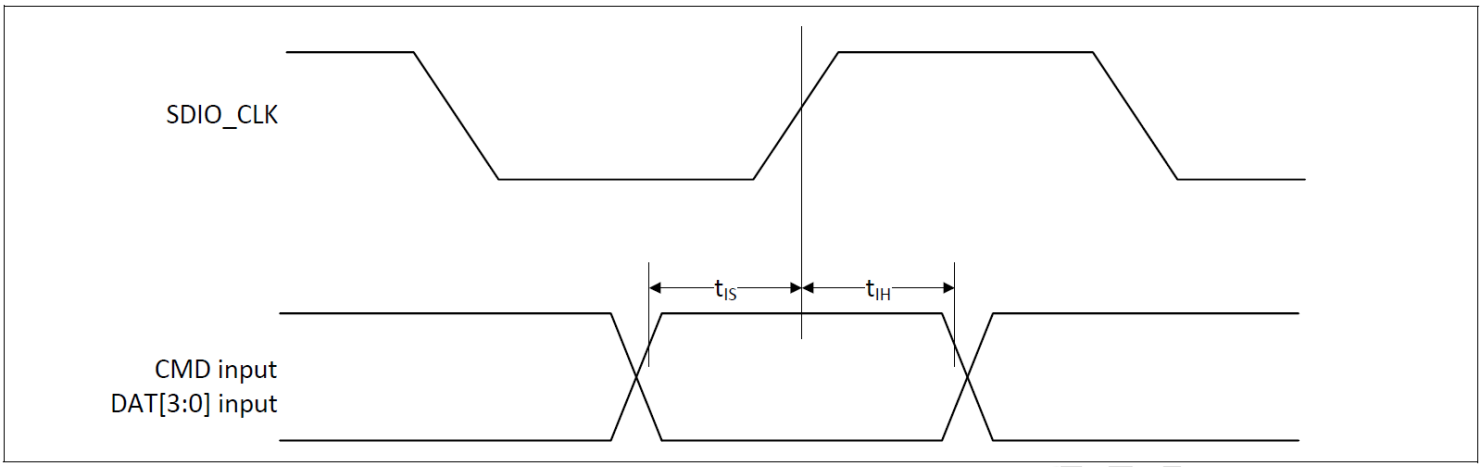
SDIO Clock Timing (SDR Modes)

Parameter	Symbol	Minimum	Maximum	Unit	Note
-	tCLK	40	-	ns	SDR12 mode
		20	-	ns	SDR25 mode
		10	-	ns	SDR50 mode
		4.8	-	ns	SDR104 mode
-	tCR,tCF	-	0.2 x tCLK	ns	tCR, tCF < 2.00 ns (max.) @100 MHz, CCARD = 10 pF tCR, tCF < 0.96 ns (max.) @208 MHz, CCARD = 10 pF
Clock duty	-	30	70	%	-

SDIO Bus Clock Timing a Parameters (SDR Modes)

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



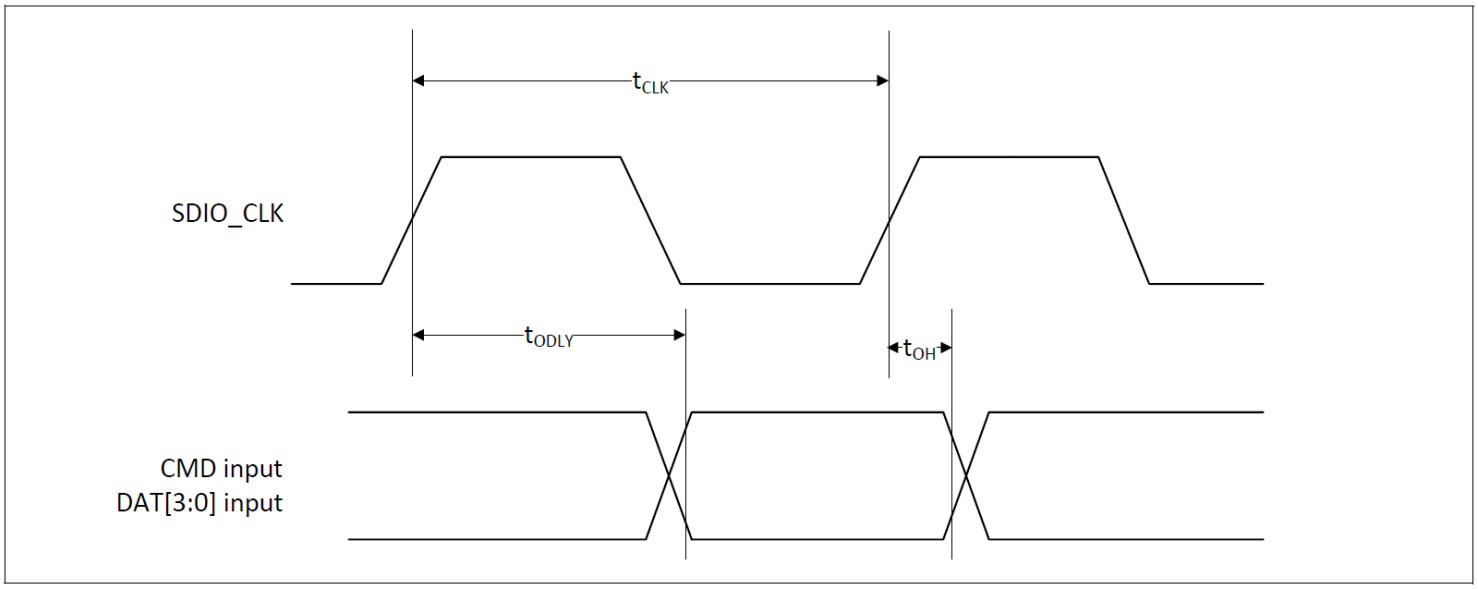
SDIO Bus Input Timing (SDR Modes)

Symbol	Minimum	Maximum	Unit	Note
SDR104 Mode				
tIS	1.4	-	ns	CCARD = 10 pF, VCT = 0.975V
tIH	0.8	-	ns	CCARD = 5 pF, VCT = 0.975V
SDR50 Mode				
tIS	3	-	ns	CCARD = 10 pF, VCT = 0.975V
tIH	0.8	-	ns	CCARD = 5 pF, VCT = 0.975V

SDIO Bus Input Timing a Parameters (SDR Modes)

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



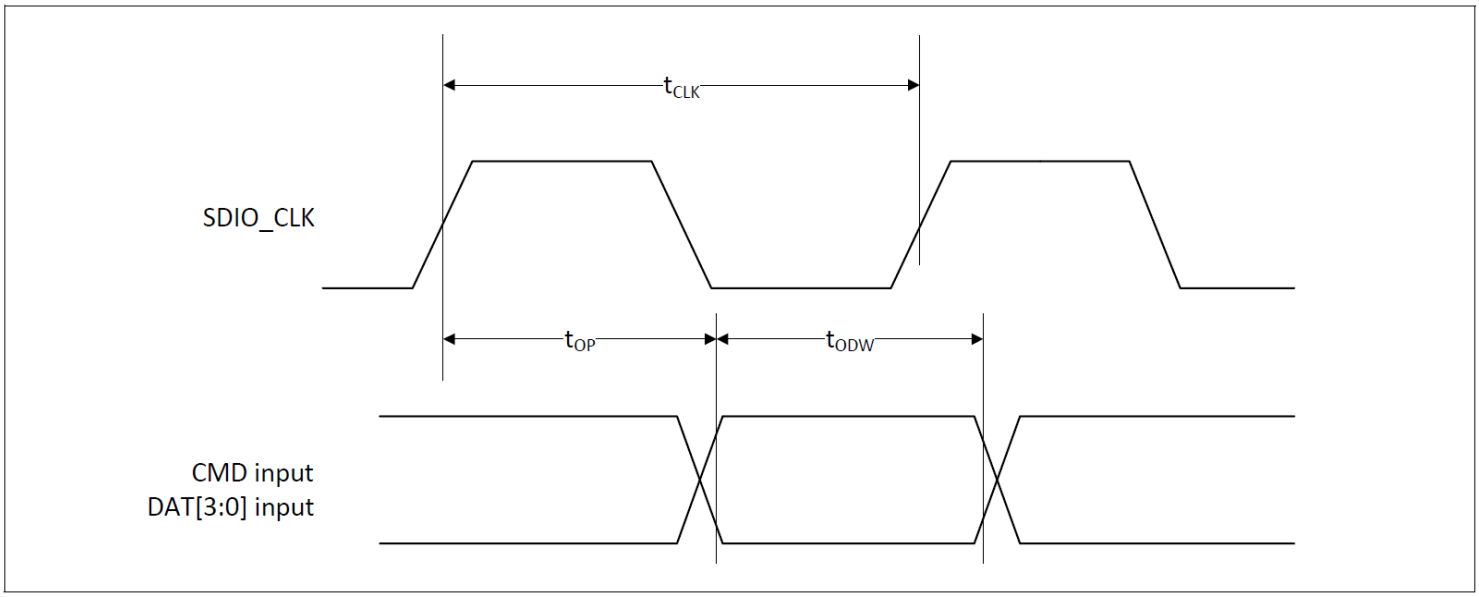
SDIO Bus Output Timing (SDR Modes up to 100 MHz)

Symbol	Minimum	Maximum	Unit	Note
tODLY	-	7.5	ns	tCLK ≥ 10 ns CL= 30 pF using driver type B for SDR50
tODLY	-	14	ns	tCLK ≥ 20 ns CL= 40 pF using for SDR12, SDR25
tOH	1.5	-	ns	Hold time at the tODLY (min.) CL= 15 pF

SDIO Bus Output Timing a Parameters (SDR Modes up to 100 MHz)

AzureWave Confi

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



SDIO Bus Output Timing (SDR Modes 100 MHz to 208 MHz)

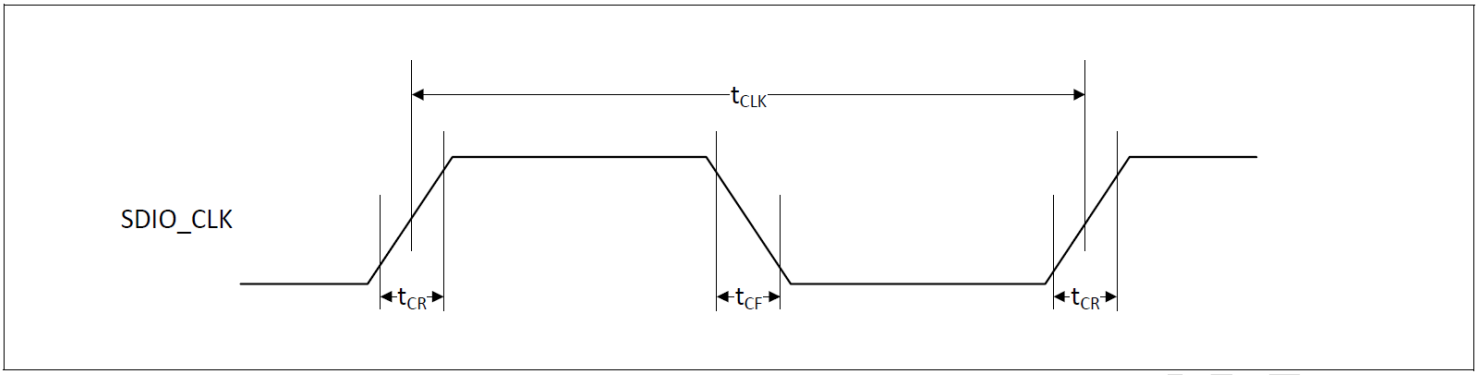
Symbol	Minimum	Maximum	Unit	Note
tOP	0	2	UI	Card output phase
△tOP	-350	1550	ps	Delay variation due to temp change after tuning
tODW	0.6	-	UI	tODW=2.88 ns @208 MHz

SDIO Bus Output Timing a Parameters (SDR Modes 100 MHz to 208 MHz)

* ΔtOP = +1550 ps for junction temperature of ΔtOP = 90 degrees during operation
* ΔtOP = –350 ps for junction temperature of ΔtOP = –20 degrees during operation
* ΔtOP = +2600 ps for junction temperature of ΔtOP = –20 to +125 degrees during operation

AzureWave Confi

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



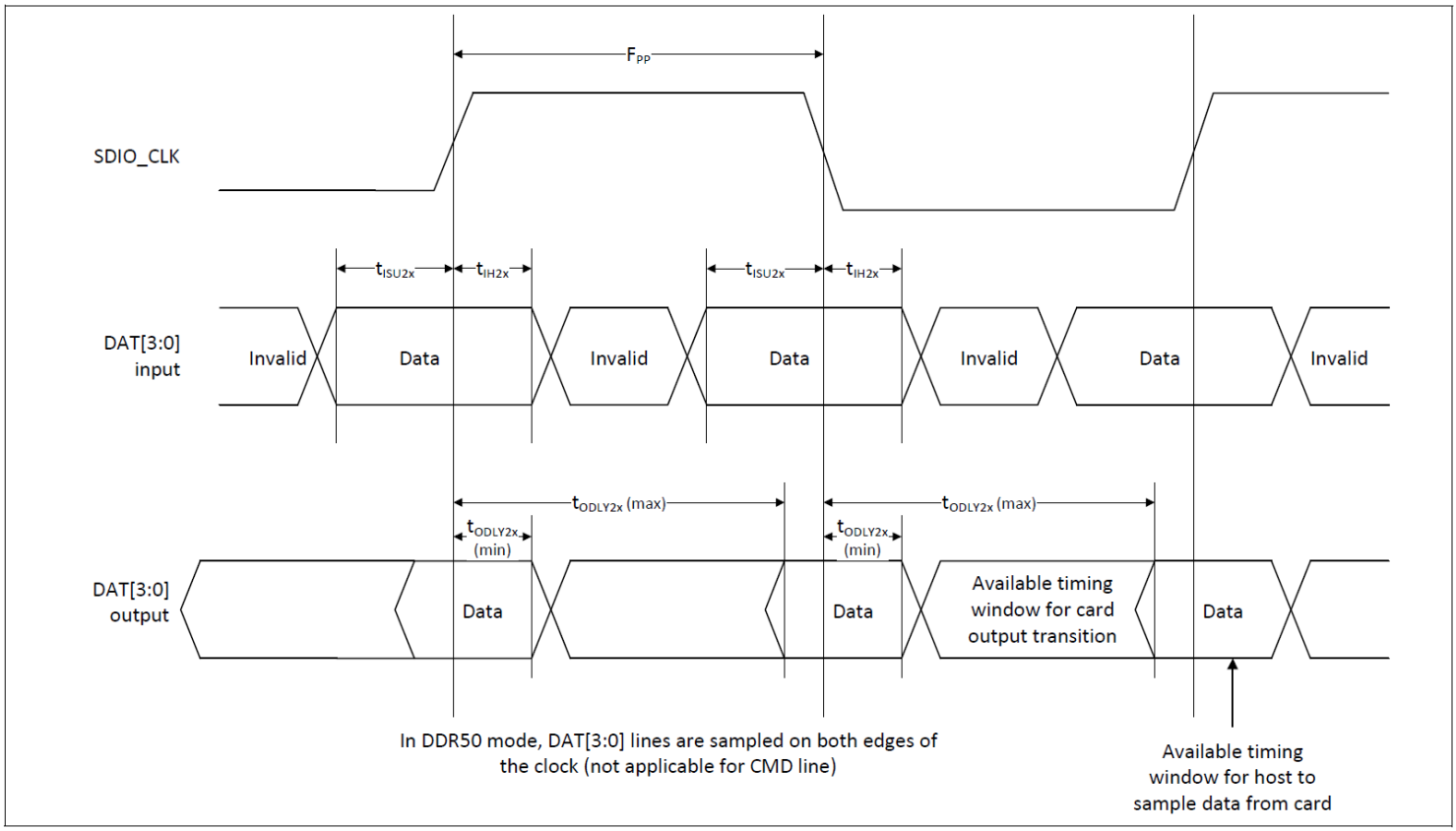
SDIO Clock Timing (DDR50 Modes)

Parameter	Symbol	Minimum	Maximum	Unit	Note
-	tCLK	20	-	ns	DDR50 mode
-	tCR,tCF	-	0.2 x tCLK	ns	tCR, tCF < 4.00 ns (max.) @50 MHz, CCARD = 10 pF
Clock duty	-	45	55	%	-

SDIO Bus Clock Timing a Parameters (DDR50 Mode)

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



SDIO DATA Timing (DDR50 Mode)

Parameter	Symbol	Minimum	Maximum	Unit	Note
Input CMD					
Input setup Time	tISU	6	-	ns	CCARD < 10 pF (1 Card)
Input hold Time	tIH	0.8	-	ns	CCARD < 10 pF (1 Card)
Outputs: CMD					
Output delay time	tODLY	-	13.7	ns	CCARD < 30 pF (1 Card)
Output hold time	tOH	1.5	-	ns	CCARD < 15 pF (1 Card)
Input DAT					
Input setup Time	tISU2x	3	-	ns	CCARD < 10 pF (1 Card)
Input hold Time	tIH2x	0.8	-	ns	CCARD < 10 pF (1 Card)
Outputs: DAT					
Output delay time	tODLY2x	-	7.5	ns	CCARD < 25 pF (1 Card)
Output hold time	tOH2x	1.5	-	ns	CCARD < 15 pF (1 Card)

SDIO Bus Timing a Parameters (DDR50 Mode)

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.4.3 UART Interface

The AW-CM235NF includes a single UART for Bluetooth. The UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 9600 bps to 4.0 Mbps. The interface features an automatic baud rate detection capability that returns a baud rate selection. Alternatively, the baud rate may be selected through a vendor-specific UART HCI command.

UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFOs is conducted through the AHB interface through either DMA or the CPU. The UART supports the Bluetooth 4.0 UART HCI specification: H4, a custom Extended H4, and H5. The default baud rate is 115.2 Kbaud.

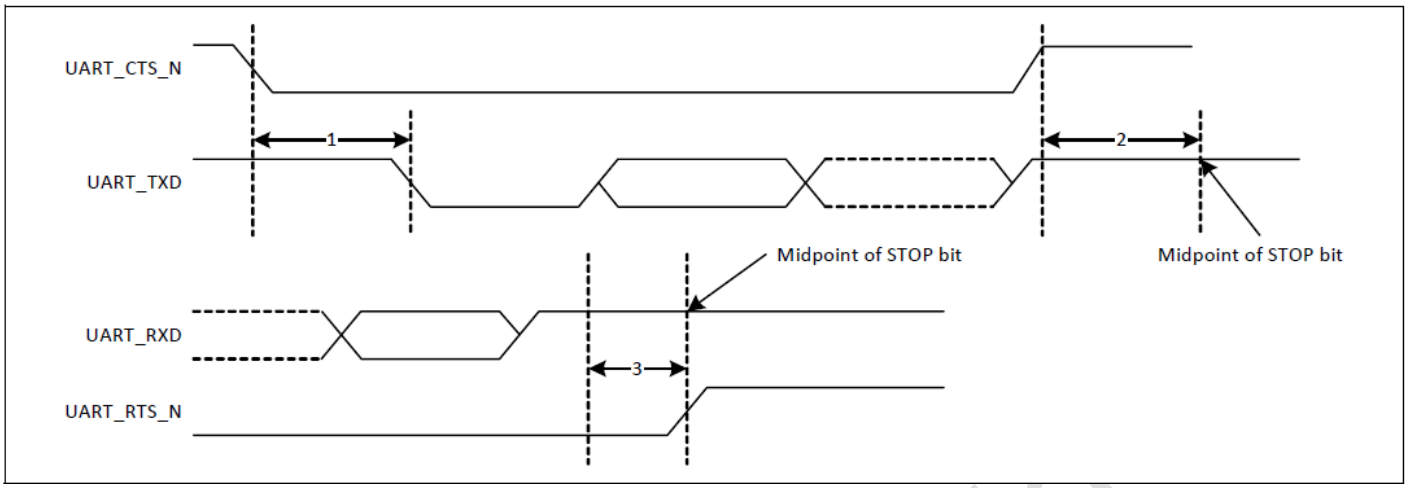
The UART supports the 3-wire H5 UART transport, as described in the Bluetooth specification (“Three-wire UART Transport Layer”).Compared to H4, the H5 UART transport reduces the number of signal lines required by eliminating the CTS and RTS signals.

The AW-CM235NF UART can perform XON/XOFF flow control and includes hardware support for the Serial Line Input Protocol (SLIP). It can also perform wake-on activity. For example, activity on the RX or CTS inputs can wake the chip from a sleep state.

Normally, the UART baud rate is set by a configuration record downloaded after device reset, or by automatic baud rate detection, and the host does not need to adjust the baud rate. Support for changing the baud rate during normal HCI UART operation is included through a vendor-specific command that allows the host to adjust the contents of the baud rate registers. The AW-CM235NF UARTs operate correctly with the host UART as long as the combined baud rate error of the two devices is within ±2%.

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.



UART Timing

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	Delay time, UART_CTS_N low to UART_TXD valid	-	-	1.5	Bit periods
2	Setup time, UART_CTS_N high before midpoint of stop bit	-	-	0.5	Bit periods
3	Delay time, midpoint of stop bit to UART_RTS_N high	-	-	0.5	Bit periods

UART Timing Specifications

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

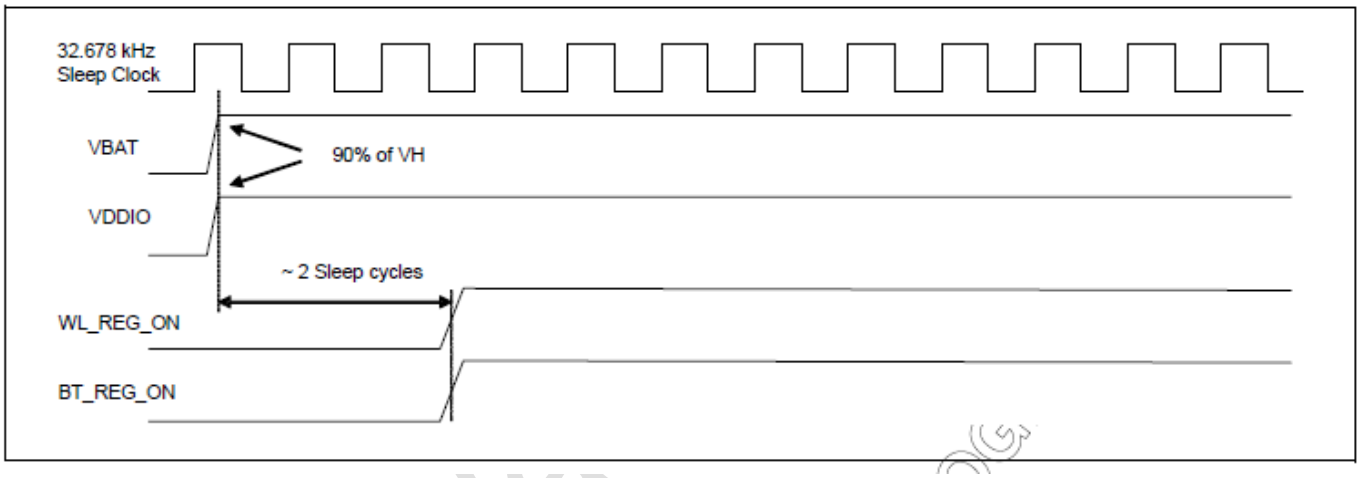
3.5 Power up Timing Sequence

The AW-CM235NF has three signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN, and internal regulator blocks. These signals are described below. Additionally, diagrams are provided to indicate proper sequencing of the signals for various operational states. The timing values indicated are minimum required values; longer delays are also acceptable.

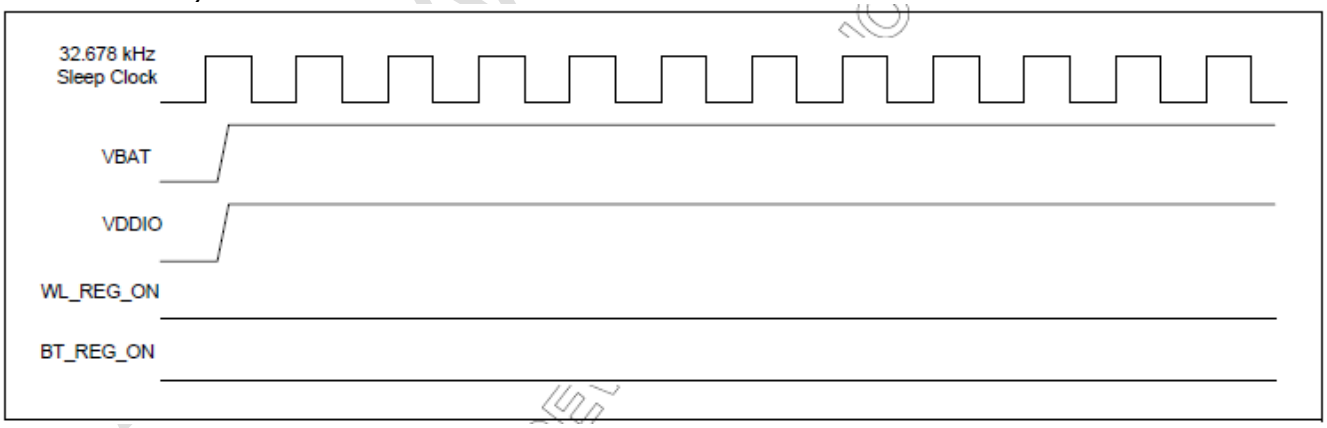
Note:

- **For both the WL_REG_ON and BT_REG_ON pins, there should be at least a 10 ms time delay between consecutive toggles (where both signals have been driven low). This is to allow time for the CBUCK regulator to discharge. If this delay is not followed, then there may be a VDDIO in-rush current on the order of 36 mA during the next PMU cold start.**
- **VBAT should not rise 10%–90% faster than 40 microseconds. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high**.

WLAN = ON, Bluetooth = ON

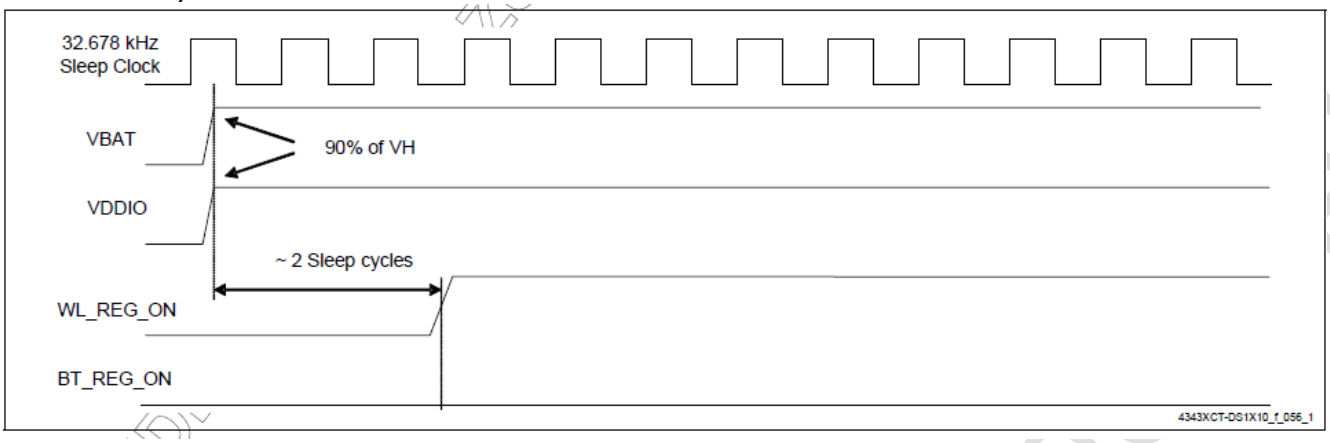


WLAN = OFF, Bluetooth = OFF

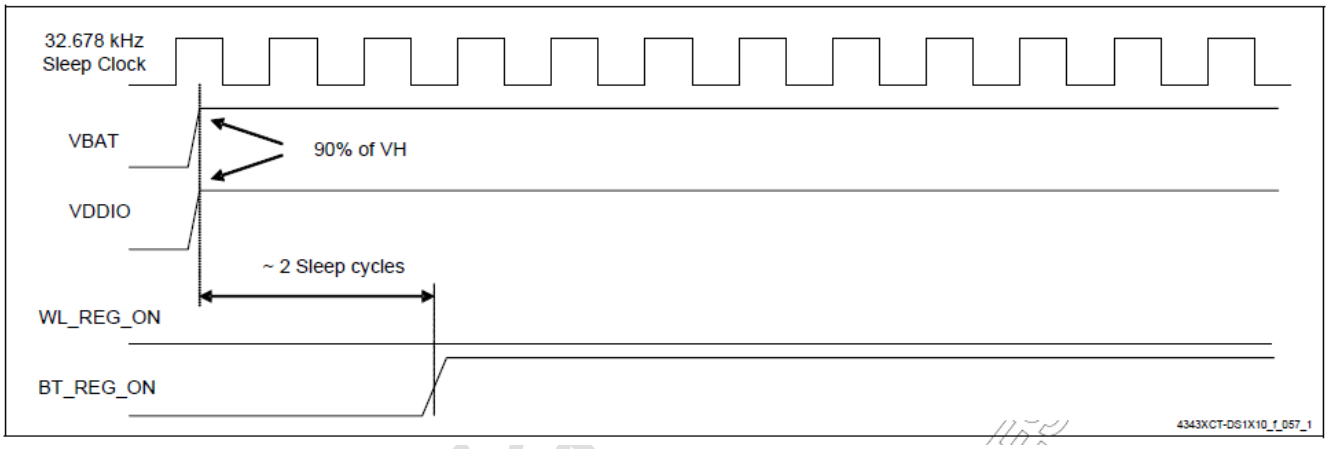


The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

WLAN = ON, Bluetooth = OFF



WLAN = OFF, Bluetooth = ON



The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

3.6 Power Consumption*

3.6.1 WLAN

Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit			Receive	
				Max.	Avg.	Duty. (%)	Max.	Avg.
2.4	11b@1Mbps	20	16	316.4mA	291.9mA	98.9%	69.4 mA	68.1 mA
	11g@54Mbps	20	14	333.1mA	212.1mA	64.8%	68.0 mA	67.6 mA
	11n@MCS7	20	13	309.7mA	210.6mA	63.3%	73.4 mA	67.5mA
	11n@MCS7	40	11	306.9mA	200 mA	57.9%	81.8mA	81.5mA
	11n@MCS15	40	11	530.8mA	308 mA	50%	114.4mA	114.2mA
5	11a@54Mbps	20	13	297.1mA	212.2mA	87.6%	83.0mA	82.8mA
	11n@MCS7	20	12	284.5mA	227.5mA	78.2%	84.6mA	82.7mA
	11n@MCS7	40	10	290.8mA	200.2mA	51.2%	98.6mA	98.4mA
	11ac@MCS9 NSS1	80	8	320.6mA	237.8mA	47.8%	125.0mA	124.9mA
	11ac@MCS9 NSS2	80	8	564.3mA	347.1mA	47.1%	184.9mA	184.7mA

3.6.2 Bluetooth

No.	Mode	Packet Type	VBAT_IN=3.3 V	
			Max.	Avg.
1	Sleep	n/a		5.29 uA
2	Page scan	n/a	10.9mA	158.2uA
3	Transmit *(4)	DH5	23.5 mA	22.6 mA
4	Receive	3-DH5	15.6 mA	15.3 mA

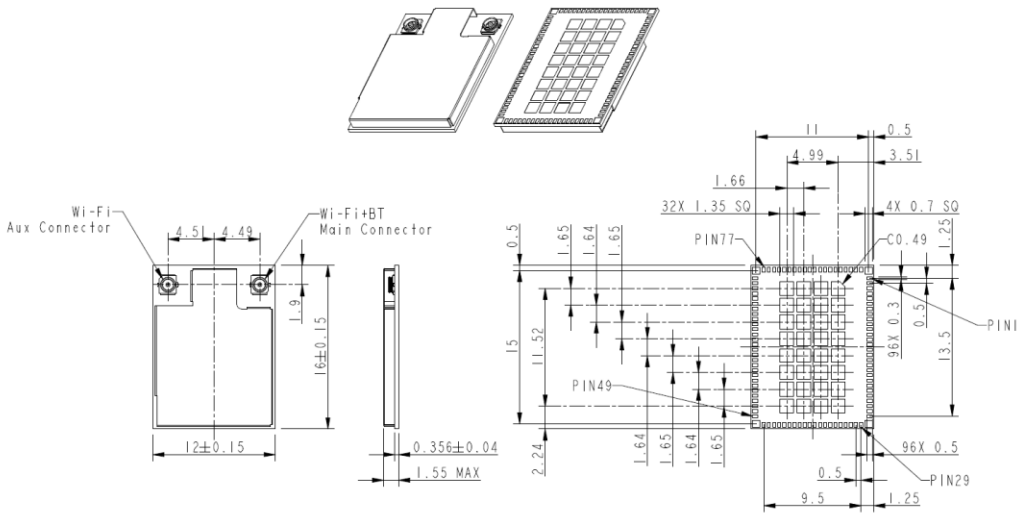
* The power consumption is based on Azurewave test environment, these data for reference only.

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

4. Mechanical Information

4.1 Mechanical Drawing



TOLERANCES UNLESS OTHERWISE SPECIFIED : ±0.15mm

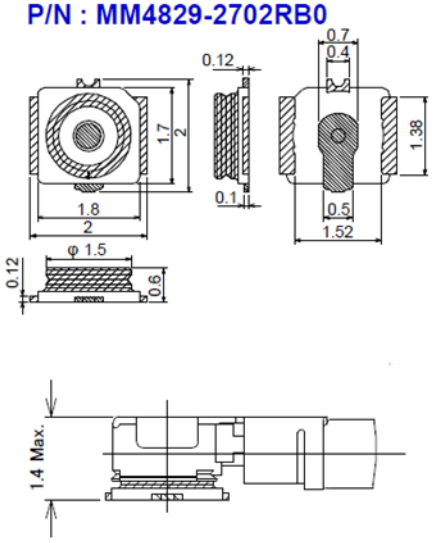
			AzureWave					SCALE 2/1		DESCRIPTION PCB ASSEMBLY		MODEL NO: 2235NF	APPROVAL
								Q'TY 1 PCS		MATERIAL	FINISH	DWG NO: 2235NF-COD-001	DESIGNED STEVE CHANG
			DIM.	0~80	80~180	180~315	315~800	UNIT MM	REV A			PART NO:	DATE 2017/10/11
ITEM	DESCRIPTION	DATE	TOL.	0.1	0.15	0.20	0.25						

AzureWave

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

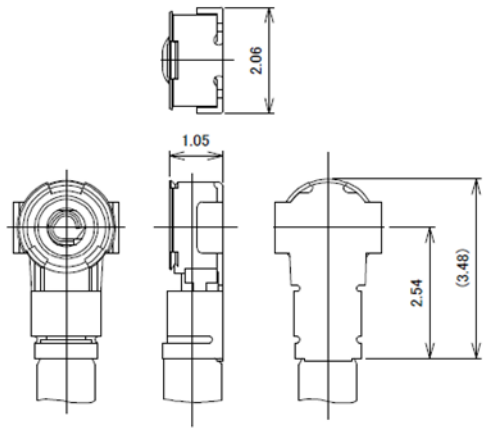
HSC Receptacle

P/N : MM4829-2702RB0



HSC Cable

P/N : MXHG_ _ _ _ _ _ _ _ _



AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

5. Packaging Information

5.1

5.2

5.3

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.

PINK BUBBLE WRAP

5.4

AFFIX PACKING LABEL

5.5

1 Carton= 5 Boxes

5.6

AFFIX PACKING LABEL

AzureWave Confidential

The information contained herein is the exclusive property of AzureWave and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of AzureWave.